



## PREDICTABILITY OF RENAL NEPHROMETRY SCORING IN DETERMINING TYPE OF SURGICAL APPROACH IN THE TREATMENT OF LOCALIZED RENAL TUMOURS : A SINGLE TERTIARY CENTER EXPERIENCE.

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**ABSTRACT** **Background:** Partial nephrectomy became more preferred option in the treatment of localized small renal tumours due to recent advances in imaging modalities and surgical techniques. Renal scoring systems are known to compliment urologist in aiding surgical decision process on extent of surgery in small localized renal tumours. There are few scoring systems described in the literature with their own limitations.

**Methods:** This is a retrospective study of patients with localized renal cell tumours who underwent nephrectomy at Nizam Institute of Medical Sciences (NIMS), Hyderabad from January 2017 to January 2019. Patients with advanced renal cell cancer disease at presentation were excluded. Total RENAL nephrometry Score (RNS), its individual component scores and complexity category were calculated based on CT report. The study cases were categorized into Group A (Partial Nephrectomy) and as Group B (Radical Nephrectomy). Mean and standard deviation value of the RENAL nephrometry scores and its component scores were calculated for each group. Statistical significance was calculated using unpaired T-test, using SPSS statistics 21.0 software.

**Results:** The mean age for all patients included in this study is 52.1 years. Out of 80 patients, 32 patients had partial nephrectomy (Group A) and 48 patients had radical nephrectomy (Group B). Based on RENAL nephrometry score complexity, Group A and Group B were further categorized into low, intermediate and high complexity score categories. The total RENAL score, individual component scores and RENAL score complexity were found to be significantly different between the two group in addition to the tumor size. No statistical significance was found between the two groups for age and type of tumour on histopathology (benign or malignant).

**Conclusion:** We conclude that preoperative RENAL nephrometry scoring is a useful aid to surgeons to classify the renal tumour complexity before deciding on effective surgical strategy for better patient outcomes.

**KEYWORDS :** RENAL nephrometry scoring, Complexity category, Localized small renal masses, Partial nephrectomy and Radical nephrectomy

### INTRODUCTION

Clinical presentation of renal cell cancer (RCC) has changed in recent past due to widespread use of radiological investigations. Incidentally detected renal masses now accounts for more than 50% of RCC cases. These tumors are more likely to be organ confined and associated with an improved prognosis.

Radical nephrectomy was the well known to be gold standard management for renal cell cancer in the past. Nephron-sparing surgery (NSS) or partial nephrectomy has been a widely accepted in the present days as preferred option in the management of clinically localized small renal masses. Different scoring systems have been developed to predict the potential surgical difficulty and risk for complications associated with a surgical plan based on renal tumour anatomical complexity like RENAL score, PADUA score, Centrality index, DAP score, ABC score etc. None of these scores are ideal and have their own limitations. But, RENAL nephrometry score (RNS) is preferred in our institute.

Due to recent advances in surgical techniques resulting in similar oncological outcomes to that of radical approach with extra benefits of renal preservation, experienced surgeons increasingly prefer renal preservation surgeries even with large and complex renal tumors. In our study, we evaluated the relationship between the RNS and its components, complexity category and the operative approach for localized renal tumors.

### OBJECTIVE

The objective of this study is to determine whether preoperative RENAL nephrometry score (RNS) components, complexity category help in decision making of operative approach in the management of localized renal tumors.

### MATERIAL AND METHOD

This is a retrospective study which included patients of localized renal cell cancer (Stage I & II) who underwent nephrectomy (either partial or radical) at NIMS, Hyderabad institute from January 2017 to January 2019. Patients with advanced renal cell cancer disease (Stage III & IV) at presentation were excluded. Ethical clearance was obtained from NIMS ethical committee (EC/NIMS/2371/2019) before commencement of the study. Patient's data such as age, pre-operative investigations, intra-operative findings, post-operative complications and histopathology findings were obtained from review of medical records. The computed tomography (CT) report of the patients was reviewed to determine the total RENAL Nephrometry Score (RNS), its individual component scores and complexity category. Most of the nephrectomies done in our institute is by open approach with a very few cases done laparoscopically. We further categorized study patients into 2 Groups. Patients who underwent partial nephrectomy were categorized as Group A and radical nephrectomy as Group B respectively. We compared total RNS, individual RNS components and complexity category between 2 groups and determined statistical significance using SPSS statistics 21.0 software.

### STATISTICAL ANALYSIS

Mean and standard deviation of the RENAL nephrometry score, its component scores and complexity category were calculated for each group. Statistical significance was calculated using unpaired T-test, using SPSS statistics 21.0 software. A p-value of  $\leq 0.05$  is considered as statistically significant.

### RESULTS

From January 2017 to January 2019, total of 118 patients presented with renal tumor to the institute. Out of 118, 38 patients (32.20%) were presented with advanced disease (Stage III & IV) at the time of diagnosis which was excluded. The remaining 80 cases comprising of 45 stage I and 35 stage II cases were included in the analysis as per inclusion and exclusion criteria.

The mean age for all patients included in the study is 52.1 years. Partial nephrectomy and radical nephrectomy patients have mean age of 49 years and 53 years respectively. In this study, there were 54 male and 26 female patients with localized renal tumours, with male to female ratio of 2.07:1.

Out of 80 patients, 32 patients had partial nephrectomy(Group A) and 48 patients had radical nephrectomy(Group B). In six patients, partial nephrectomy was planned preoperatively but intraoperatively plan was changed to radical nephrectomy. Two patients of partial nephrectomy undergone exploration and had radical nephrectomy for control of expanding hematoma. In one patient of partial nephrectomy, completion radical nephrectomy was done based on final histopathology due to positive margins.

Based on RENAL score complexity, Group A and Group B were further categorized into low complexity (4, 5, 6), intermediate complexity (7, 8, 9) and high complexity (10, 11, 12). There were 9 patients with low, 18 with intermediate and 5 with high complexity scores in the partial nephrectomy group (Group A). Whereas in radical nephrectomy group (Group B), there were no patients with low, 14 with intermediate and 34 with high complexity score category.

Twenty-one patients developed surgical complications. Most of them are grade I or II type as per clavien-dindo classification. Only 4 patients developed grade III or IV complications requiring reintervention or ICU care. Grade V complications (death) were not documented in any of the patients in this study.

Final histopathology revealed 18 benign and 62 malignant tumours. Clear cell RCC is the most common diagnosis followed by papillary RCC. Among the benign tumors, oncocytoma is the most common diagnosis followed by angiomyolipoma.

The P-value was calculated using the unpaired T-test using SPSS statistics 21.0 software. The total RENAL score, individual component scores and renal score complexity were found to be significantly different between the two group in addition to tumor size (as shown in Table 1). No statistical significance was found between the two groups for age and type of tumour on histopathology (benign or malignant). Among different components of the score, L and E score values were found to be least significantly based on p-value.

**Table 1: Distribution of age, tumor size, R score, E score, N score, L score and total renal scores between Group A and Group B.**

Variables	Group A(n=32) (Partial nephrectomy) Mean+/-SD	Group B(n=48) (Radical nephrectomy) Mean+/-SD	P-value (P-value <=0.05 as significant)
Age (in years)	49.031 +/- 14.385	53.541 +/- 14.154	P=0.169 (not significant)
Tumor Size (in cm)	4.528+/-1.474	7.933+/-2.600	<0.001 (significant)
R score	1.593+/-0.559	2.541 +/- 0.544	<0.001 (significant)
E score	1.687 +/-0.692	2.104 +/- 0.592	0.005 (significant)
N score	2.000 +/- 0.915	2.916 +/-0.341	<0.001 (significant)
L score	2.187 +/-0.780	2.520 +/- 0.545	0.027 (significant)
Total RENAL score	7.468+/-1.777	10.104 +/-1.171	<0.001 (significant)

**Table 2: Distribution of RNS scores complexities between Group A and B as well as benign and malignant tumour distribution across Group A and Group B.**

Variables	Group A(n=32) (Partial nephrectomy)	Group B (n=48) (Radical nephrectomy)	P-value (P-value<=0.05 as significant)
Low & Intermediate Complexity Score	27	14	< 0.00001 (significant)

High Complexity Score	5	34	< 0.00001 (significant)
Benign Histopathology	10	8	0.208754 (not significant)
Malignant Histopathology	22	40	0.208754 (not significant)

Our study data revealed that there were more patients who undergone partial nephrectomy had benign histopathology. However, it is not statistically significant with P=0.208754 (as shown in Table 2).

**DISCUSSION**

Partial nephrectomy is the recommended procedure for patients with Stage T1a tumors (1). Due to high long-term adverse effects of radical nephrectomy on the overall survival, more experienced surgeons are performing nephron sparing surgeries even in complex anatomical lesions.

The target of ideal partial nephrectomy should be good oncological outcome with a negative surgical margin, maximum renal function preservation, and minimal complications. To achieve this, tumors has to be removed with minimal ischemia time with a negative oncological margin. Borgmann et al. (2) shows RENAL score surpassed the PADUA score, DAP score and The C index in predicting the perioperative outcome in nephron sparing surgery. We choose RENAL nephrometry score among all scores for our study because it is simple, easy to calculate and the most studied one. The intra operative conversion rate in our study was 14.6%. This is little higher than other published studies. Galvin et al. (3) reported that their conversion rate decreased from a high initial rate of 13% at the starting of the study to 6% towards the end of the study. The average size of the tumor in the conversion group was 4.7 in their study as compared to our mean size of 5.7 with high total RENAL nephrometry score of 9 or above. So, more patients with complex anatomy may be the cause of high conversion rate in our study and it may decrease in future with more experience in nephron sparing surgery in complex cases.

6 patients planned for partial nephrectomy were converted to radical nephrectomy intra operatively. The reasons for conversion were, unable to achieve the negative margin in 4 cases and involvement of hilar structures in 2 cases. The RENAL nephrometry score in those 6 patients were 9 or more and all of those were malignant lesions detected in the frozen section as well as in the final histopathology report.

Three patients of partial nephrectomy were converted to radical nephrectomy post operatively, 2 patients for control of expanding hematoma and in 1 patient for positive margin. The single case in which completion nephrectomy was done post operatively had a frozen section report of negative margin and positive final histopathology report.

The overall surgical complication rate in our study group was 26.2% with grade III /IV complication rates of only 5% (4 patients). Jeong H O et al (4) reported similar results with overall complication rates of 30.9% in the open surgery group and 3.5% rate of grade III/IV complications. There was not a single case of urine leak in our study, which may be due to small sample size.

In our study, benign lesions were found in 18 cases (22.5%) with oncocytoma being the most common benign lesion. The proportion of benign lesions was found to be more in patients who were undergone partial nephrectomy as compared to patients who were undergone radical nephrectomy (31.2% vs 16.6%).

In our study data analysis revealed that total RENAL score values were significantly higher in the radical nephrectomy group as compared to the partial nephrectomy group (10.1 vs 7.4, P- value <0.001). All the component scores were also significantly higher in the radical nephrectomy group. Component scores like R and N were seen to be more significant, associated with P-value < 0.001. However, E and L scores were found to be less significant compared to other scores with a p value of 0.005 and 0.027 respectively. Canter et al. (5) reported that patients who underwent radical nephrectomy had a significantly larger total RENAL score, as well as larger individual R, N, and L component scores. They also found that the RENAL score accurately stratified the operative approach to solid renal masses. They also noted the less significance associated with the E score. Rosevear (6) et al reported

that patients who underwent radical nephrectomy had a larger RENAL score than patients who underwent partial nephrectomy, which suggests that the RENAL score accurately predicted the operative preference of surgeons. Our study findings are consistent with these results, especially for the total and individual component scores of the radical nephrectomy compared with the partial nephrectomy group.

RENAL score complexity was also able to predict the operative approach in our study. In all 9 patients with low complexity RENAL score of 6 or less, partial nephrectomy was done. Whereas, in 56.25% with intermediate complexity score and only in 12.82% patients with high complexity RENAL score partial nephrectomy was done.

In our analysis, 34 patients with high complexity RENAL scores had radical nephrectomy and partial nephrectomy in 5 cases only. Whereas, intermediate complexity group RENAL score patients had undergone partial nephrectomy in 18 patients and radical nephrectomy in 14 patients. Out of the 14 patients in whom radical nephrectomy was performed, 11 patients had a RENAL score of 9 and 2 had RENAL score of 7 and 1 patient had a RENAL score of 8.

None of the patients with low complexity RENAL scores had radical nephrectomy. Low and intermediate complexity RENAL score patients were found to undergo partial nephrectomy compared to high complexity RENAL score patients (P-value <0.0001).

## CONCLUSION

We conclude that RENAL nephrometry scores were effectively used to classify the complexity of renal tumours before deciding on surgical approach. Our data suggested majority of patients with low complexity scores can be successfully managed with partial nephrectomy. However, high complexity scores required radical nephrectomy. In intermediate complexity cases, both partial and radical nephrectomy might be feasible based on the tumor characteristics and surgeon's expertise.

## CONFLICT OF INTEREST

Authors declare no conflict of interest.

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## REFERENCES:

1. Campbell S, Uzzo RG, Allaf ME, Bass EB, Cadeddu JA, Chang A, Clark PE, Davis BJ, Derweesh IH, Giambardino L, Gervais DA, Hu SL, Lane BR, Leibovich BC, Pierorazio PM. Renal Mass and Localized Renal Cancer: AUA Guideline. *The Journal of Urology* (2017), doi: 10.1016/j.juro.2017.04.100.
2. Borgmann H, Reiss A, Kurosch M, Filmann N, Frees S, Mager R, Tsaour I, Haferkamp A. RENAL score outperforms PADUA score, C-index and DAP score for outcome prediction of nephron-sparing surgery in a selected cohort. *Journal of Urology* (2016), doi: 10.1016/j.juro.2016.03.176.
3. Galvin DJ, Savage CJ, Adamy A, Kaag M, O'Brien MK, Kallungal G et al . Intraoperative Conversion From Partial to Radical Nephrectomy at a Single Institution From 2003 to 2008. *Journal of Urology* (2011), Vol. 185, 1204-1209.
4. Jeong Hyun Oh, Hyun Yul Rhew, Taek Sang Kim. Factors Influencing the Operative Approach to Renal Tumors: Analyses According to RENAL Nephrometry Scores. *Korean J Urol* (2014), 55:97-101.
5. Canter D, Kutikov A, Manley B, Egleston B, Simhan J, Smaldone M, et al. Utility of the R.E.N.A.L. nephrometry scoring system in objectifying treatment decision-making of the enhancing renal mass. *Urology* (2011), 78:1089-94
6. Rosevear HM, Gellhaus PT, Lightfoot AJ, Kresowik TP, Joudi FN, Tracy CR. Utility of the RENAL nephrometry scoring system in the real world: predicting surgeon operative preference and complication risk. *BJU Int* (2012), 109:700-5.